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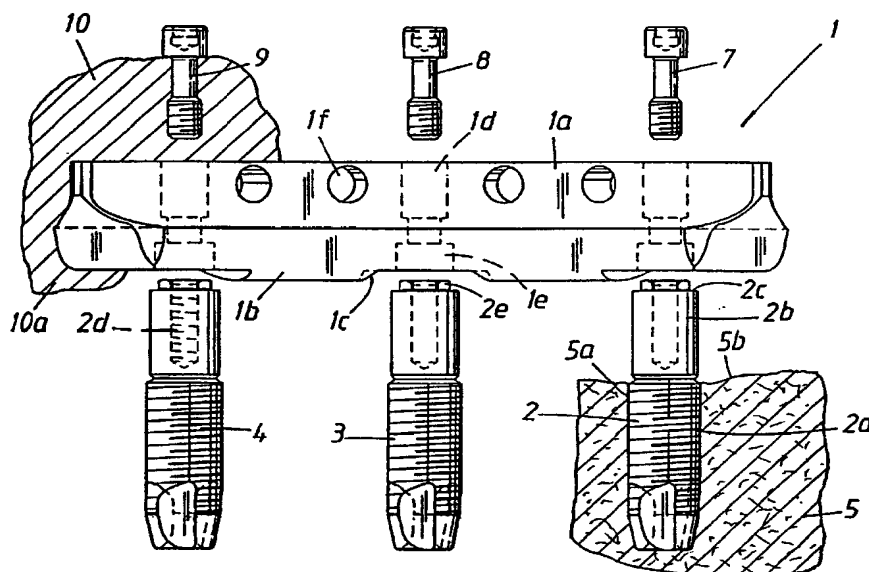
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(54) Title: METHOD AND ARRANGEMENT FOR AN IMPLANT SUPERSTRUCTURE



(57) Abstract: A superstructure is included together with other components in a tooth prosthesis system, by means of which a tooth prosthesis is intended to be applied to a patient in a short application time, for example in one or only a few days. The superstructure (1) is designed with a bearing part (1b) which can cooperate with fixture members, and a tooth-prosthesis-supporting part, and the parts are designed with recesses for said securing members. The bearing part and the tooth-prosthesis-supporting part are integrated over at least most of their horizontal extents by means of the parts being produced from a common blank or a material composition using a treatment or method which gives a user-friendly outer shape and bevels on the unit or superstructure forming the parts.

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Method and arrangement for an implant superstructure

The present invention relates to a method for producing a superstructure which is included in a tooth
5 prosthesis system together with, inter alia, positioning members, drill guide sets, fixture guide sets and fixtures or fixture members, for example fixtures with associated spacer members, and securing members for anchoring the superstructure in the
10 fixtures or fixture members, by means of which tooth prosthesis system a tooth prosthesis is intended to be applied (to a patient) at the time when, or a short time after, the fixtures have been applied (implanted) in the patient's jaw bone, for example on the same day
15 or after just a few days. The superstructure can in this case be designed with a bearing part which can cooperate with the fixtures or fixture members, and a tooth-prosthesis-supporting part. The parts are designed with recesses through which the securing
20 members extend upon said anchoring. The invention also relates to an arrangement in association with said superstructure.

It is already known, for example from Swedish Patents 9602554-9 (506850) and 9602555-6 (506849), to
25 provide such a tooth prosthesis system by means of which implantation and tooth prosthesis structuring can be executed in a very short time compared with the current times of 3 to 6 months. Reference is also made to the BRÄNEMARK NOVUM® system which is described for
30 example in "Clinical Implant Dentistry and Related Research, Volume 1, Number 1, 1999" and the publication "Brånemark Osseointegration Center, May 99". The concept is also described in the "Manual for Clinical Investigation 1999". From the first-mentioned patent
35 specification it is known to use a superstructure which expediently comprises a separate rail with securing members and a tooth prosthesis bridge which can be attached to the rail (see, for example, page 5, paragraph 4). The use of two matching upper and lower

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parts which are intended to bear against each other via a contact surface is also shown in detail in said "Manual".

5 In the field of dentistry there is an urgent need to reduce the number of parts and components and at the same time to simplify techniques of producing and using said parts and components. There are a very large number of components on the market, and every successful attempt at implementing tried and tested and
10 novel methods for effective treatment using a reduced number of components is seen as a step forward not only from the purely technical point of view, but also from organizational and economic points of view. When fitting a tooth prosthesis, it is essential to have
15 access to components which are easy to adapt to different individuals, and in this respect it is important to have access to components and parts which are not critical from, for example, the point of view of structural height. It is also important to be able
20 to make changes to the implantation method as such without adversely affecting the final result. It is important to be able to shorten the treatment time for the patient and thus eliminate certain intermediaries without adversely affecting the final result. It is
25 also important to be able to improve the purely esthetic effect of the implanted tooth prosthesis. The main object of the present invention is to solve all or some of these problems.

That which can principally be regarded as
30 characterizing a method according to the invention is that the bearing part and the crown-supporting part are integrated over at least most of their horizontal extents, at the time of or in connection with the manufacture of the parts, by means of the parts being
35 produced from a common blank or a material composition using a treatment or method which gives user-friendly outer shapes or bevels on the parts.

In further developments of the inventive concept, it is proposed that, at the time of

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manufacture, the tooth-prosthesis-supporting part is given a shape which, in the horizontal cross section of the superstructure, is narrower than the bearing part, and that the parts are in this case formed with an outside transition which forms a curved or arc-shaped transition between the parts. Moreover, at its end surfaces which can cooperate with the fixtures or fixture members, the bearing part can be given depressions with plane bottom surfaces which are opposite the end surfaces of the fixtures or fixture members. The plane bottom surfaces of the depressions are given surface areas which exceed the surface areas of the fixtures or fixture members at the parts of the fixtures or fixture members cooperating with said bearing part. Moreover, at the time of its manufacture, the crown-supporting part can be provided with a number of holes extending in the transverse direction. Said parts can be made of titanium or another tissue-compatible material or tissue-compatible alloy. In a preferred embodiment, the parts are designed with a relatively low height, for example a height of between 0.5 and 1.0 mm, preferably between 0.7 and 0.8 mm. In one illustrative embodiment, the unit made up of said parts is produced by machining of a blank with subsequent grinding and/or barrel-polishing of sharp edges and production of outer bevels which give said user-friendliness. In a further embodiment, the unit forming the parts can be produced by casting material which can be sintered and solidified, and by subjecting it to a sintering procedure, and by subsequent working of the outer shape to give said user-friendliness. Moreover, at its front parts, the unit forming the superstructure can be provided or covered with material forming the tooth prosthesis, for example acrylate or another synthetic material normally used in tooth prostheses. The recesses for the securing members can have diameters which are only slightly less than the width of the tooth-prosthesis-supporting part. At the time of its production, the unit forming the

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superstructure can be given an arc shape and, at the ends of the arc shape, there are parts with a first bevel which is arranged on the bearing part and which via a curved part merges with the lower surface of the tooth-prosthesis-supporting part, which in turn is curved up toward the outer edge of the tooth-prosthesis-supporting part via a second bevel.

That which can principally be regarded as characterizing an arrangement according to the invention is set out in the characterizing clause of the attached independent arrangement claim. Embodiments of the arrangement are set out in the subclaims linked to said independent claim.

By means of what is proposed above, which runs counter to the avenues already followed in the prior art and thus opens up new approaches in this field, it is possible to eliminate an intermediate stage in the treatment by omitting the mutual relating and adapting of two cooperating parts. The material-working time in machine-working or "milling" of a blank can be substantially reduced and rendered less expensive. Considerable freedom of choice of the structure of the components can be allowed, and user-friendly and esthetically pleasing tooth prostheses can be obtained.

A presently proposed embodiment of a method and of an arrangement according to the invention will be described below with reference to the attached drawings, in which:

Figure 1 shows, from the rear and in partial cross section, a superstructure and three implants or fixtures set in relation to it, with spacer members, securing screws for anchoring the superstructure in the implant, and areas of dentine, for example in the lower jaw of a human,

Figure 2 shows, in a perspective view obliquely from above right/from the rear, the superstructure with the implants/fixtures and the securing screws according to Figure 1,

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Figure 3 shows, in a horizontal view from above, the superstructure in one structural illustrative embodiment,

Figure 4 shows the superstructure according to Figure 3 from the inside and in a side view,

Figure 5 shows the superstructure according to Figures 3 and 4 from below,

Figure 6 shows the superstructure according to Figure 4 from the side,

Figure 7 shows said superstructure in cross section along A-A in Figure 6,

Figure 8 shows the superstructure from the side and slightly turned in relation to Figure 6,

Figure 9 shows the superstructure in a perspective view, obliquely from above left,

Figure 10, in cross section along B-B in Figure 5, shows the design of the bearing part and the crown-supporting part at one of the recesses for the securing members, and

Figure 11 shows the cross section of the unit along C-C in Figure 5.

In Figure 1, a superstructure is shown by 1. The superstructure comprises a tooth-prosthesis-supporting part 1a, and a bearing part 1b which can cooperate with fixtures 2, 3 and 4. The parts 1a and 1b form a common unit, integrated along the greater part of their imaginary surfaces facing each other, cf. the surfaces of the separate parts according to the prior art. Each fixture is built in a manner known per se and can comprise an implant part which is provided with a thread 2a, by means of which the implant or fixture can be screwed down into a hole in partially indicated dentine (jaw bone) 5, preferably the lower jaw of a patient. The hole in the jaw bone is indicated by 5a in Figure 1. At its upper end, the fixture or implant screwed down into the actual dentine or jaw bone has a spacer member which, in the incorporated state of the implant, is intended to extend above a jaw bone surface 5b. The implant can be of the self-tapping type, and

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for examples of implants reference can be made to Swedish patent application 9900822-9 with date of filing March 9, 1999. The upper end of the implant or the spacer member 2b has a plane end surface 2c. The bearing part 1b is provided with depressions 1c with plane bottom surfaces against which the upper surfaces 2c of the implants are intended to bear. The unit 1 can be anchored in the implant by means of anchoring screws 7, 8 and 9. The anchoring screws extend in recesses 1d through the unit 1 and each implant or spacer member is provided with a thread 2d, in which the respective screw or in which the respective anchoring member 7, 8 or 9 can be anchored. This anchoring is therefore done in a manner known per se. The upper part 1a is provided with a number of through-holes 1f which extend in the transverse direction of the upper part and which are used for holding the tooth-prosthesis-supporting part 1a, as is symbolically indicated by 10. On its upper side, each implant or each spacer member is provided with a hexagon 2e which is arranged to protrude into a recess 1e with a shape corresponding to the hexagon or with a shape locking the hexagon. The hexagon 2e can be of another shape. The tooth prosthesis material 10 can be designed with a part 10a which extends well above and covers both the part 1a and the part 1b, thus affording advantages from the esthetic point of view.

Figure 2 is intended to show the design or curve of the superstructure in a horizontal plane, which design or curve is arc-shaped and has an arc shape or curve following the curvature of the symbolically indicated dentine 5. The figure shows the application of the implants 2, 3 and 4 and the securing screws 7, 8 and 9 in said arc shape.

In Figure 3, the superstructure is shown with its parts 1a and 1b, from which it will be seen that the part 1a has a narrower design than the part 1b. In the example shown, the arc shape is substantially circular and the center is indicated by 11. A radius r to the outer edge of the part 1b is of the order of

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size of 23 mm. A radius r' to the circular center line of the parts 1a and 1b is of the order of size of 20 mm. A radius r'' to the arc-shaped inner edge of the lower part is chosen at about 17 mm. The radii r''' and
5 r'''' to the arc-shaped outer and inner sides, respectively, of the part 1a are chosen at about 21 mm and 18 mm, respectively. In the horizontal plane shown, the distances L , L' between the securing member recesses 1d are chosen at about 14.75 mm. A distance d
10 in the radial direction between the recesses is chosen at about 6.5 mm. In Figure 3, a first angle α has been indicated for the radius R from the rearward/inward narrowing of the part 1b. Said narrowing starts at a value of about 140° at said angle α . Said start of
15 narrowing at the radii R is related to the inner surface of the part 1b. A narrowing is also present for the outer surface of the part 1b and the last-mentioned narrowing starts at a greater angle α (not shown in the figure for reasons of clarity).

20 In Figure 4, the height of the superstructure is indicated by H . This height can be between 5 and 8 mm, for example about 6.5 mm. Figure 4 also shows the size of the depression 1c, or rather a height h between an underside 1g of the superstructure and a bottom
25 surface of the respective depression. Dimension h is about 0.5 mm less than the height H . The bottom surface of the depression 1c has a surface area 1 which exceeds the corresponding surface area of the surface 2c of the implant concerned (cf. Figure 1).

30 In Figure 5, the depressions 1c on the part 1b are shown from below. The surface area extents 1 are again shown. As will be seen from the figure, the surface area of the depressions is narrower at the inner surface of the part 1b than at the outer surface
35 of the same part. Figure 5 also shows that, at said radius R , the part 1b merges at its ends into a narrowed shape, in the horizontal section according to Figure 5, toward the points 1b' and 1b'' of the

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superstructure. The total depth of the superstructure is indicated by D and is chosen at about 25.7 mm.

Figure 6 shows the positions of the holes 1f on the part 1a, a distance d' between the lower surface 1g and the center line 1k of the hole having been chosen at about 1.5 mm.

Figure 7 shows the mutual relationships of the holes and their relationship to the central recess 1d. The angle between the recess 1d and each through-hole is indicated by means of the angles α'' which can be chosen at about 35°. The distance between the inner transverse holes and the recess 1d is indicated by the angles α''' and in the present case has been chosen at about 15°. The parts 1a and 1b are also indicated in this case.

Figure 8 shows the terminal transition between the parts 1a and 1b at the ends 1b' and 1b''. Said transitions are characterized by a first phase 11, 11' which merges into a curved transition part or 12, 12' and is thereafter finished by a further upswing phase 13, 13'.

Figure 9 shows said phases (although not marked in the figure) at said ends 1b' and 1b''.

Figures 10 and 11 show in detail the cross sections of parts 1a and 1b. The part 1a has a width of about 2.8 mm in the depth direction which is indicated by A. The width or depth of the part 1b is indicated by A' and is chosen at about 5.5 mm. The part 1b at the hole or recess 1d of the securing member is indicated by 1h' and assumes a value of about 3 mm. The corresponding height h'' at the position alongside the hole 1d, i.e. the position according to Figure 11, assumes values of about 3.2 mm. Figure 11 also shows the outside transitions 11, 11'. Said transitions are arc-shaped or curved. Figure 8 too shows the transition 11.

The superstructure can be used in combination with positioning members, drill guide sets and fixture guide sets of the type shown in Swedish patent

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specification 9602554-9 (506850) mentioned at the outset. These members are therefore not described in detail here, but reference is made to the embodiments according to said patent.

5 The superstructure can be produced by means of machining equipment in the form of milling members. After milling, the milled superstructure is surface-treated, for example by grinding equipment. Such equipment is already well known.

10 Alternatively, a material composition or a material powder can be introduced into a mold for casting the superstructure. The superstructure thereby formed in the mold is sintered in an oven or can be made of a material that can solidify. The production
15 equipment can in this case too consist of types known per se and will therefore not be described in detail here.

 By means of the above embodiment of the superstructure, the latter does not therefore have to
20 take part in the covering function for the implants implanted in the dentine or jaw bone, and instead these implants or their ends can be exposed or uncovered during tooth prosthesis application to the unit forming the superstructure. This function affords the
25 considerable advantage that adjustment between two different parts does not need to take place and that the covering function for the implant ends is not itself necessary in accordance with the proposal of the invention.

30 According to Figure 1, the front parts of each implant in accordance with the above have cutting edges 2f which provide a direction-stabilizing function during screwing into the dentine, irrespective of any inhomogeneity of the latter. The design and function of
35 the cutting edge are described in the abovementioned patent application.

 The invention is not limited to the embodiment described above by way of example, and instead it can

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be modified within the scope of the attached patent claims and the inventive concept.

PATENT CLAIMS

1. A method for producing a superstructure (1) which is included in a tooth prosthesis system together with, inter alia, positioning members (14), drill guide sets (15), fixture guide sets (16) and fixtures (2, 3, 4) or fixture members, for example fixtures together with spacer members, and securing members (7, 8, 9) for anchoring the superstructure in the fixtures or fixture members, by means of which tooth prosthesis system, for example, a tooth prosthesis is designed to be applied (to a patient) in a short application time, for example in one or only a few days, the superstructure (1) being designed with a bearing part (1b) which can cooperate with the fixtures or fixture members, and a tooth-prosthesis-supporting part (1a), and the parts being designed with recesses (1d) through which the securing members (7, 8, 9) extend upon said anchoring, characterized in that the bearing part (1b) and the tooth-prosthesis-supporting part (1a) are integrated over at least most of their horizontal extents, at the time of or in connection with the manufacture of the parts, by means of the parts being produced from a common blank or a common material composition using a treatment or method which gives user-friendly outer shapes or bevels (1h, 1i) on the parts.

2. The method as claimed in patent claim 1, characterized in that, at the time of manufacture, the tooth-prosthesis-supporting part (1a) is given a shape which, in the horizontal cross section of the superstructure (1), is narrower than the shape of the bearing part (1b), and in that the parts are formed with one or more outside transitions (1l, 1l') which each form a curved or arc-shaped transition between the parts (1a, 1b).

3. The method as claimed in patent claim 1 or 2, characterized in that, at its surface which can cooperate with the fixtures or fixture members, the

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bearing part (1b) is given depressions (1c) with plane bottom surfaces which are opposite the end surfaces (2b) of the fixtures or fixture members, and in that the plane bottom surfaces of the depressions are given surface areas which exceed the surface areas of the fixtures or fixture members at the parts of the fixtures or fixture members cooperating with said bearing part.

4. The method as claimed in any of the preceding patent claims, characterized in that, at the time of its manufacture, the tooth-prosthesis-supporting part (1a) is provided with a number of holes (1f) extending in the transverse direction.

5. The method as claimed in any of the preceding patent claims, characterized in that the parts are made of titanium or another equivalent tissue-compatible material or tissue-compatible alloy.

6. The method as claimed in any of the preceding patent claims, characterized in that the parts (1a, 1b) are designed with a common low height (H), for example with a height of between 0.5 and 1.0 mm, preferably between 0.7 and 0.8 mm.

7. The method as claimed in any of the preceding patent claims, characterized in that the unit or superstructure forming the parts is produced by machining with subsequent grinding and/or barrel-polishing of sharp edges and production of outer bevels which give user-friendliness.

8. The method as claimed in any of patent claims 1-6, characterized in that the unit or superstructure forming the parts is produced by casting sinterable material and carrying out a sintering procedure or solidifying procedure, and by subsequent working of the outer shape to give user-friendliness.

9. The method as claimed in any of the preceding patent claims, characterized in that, at its front end, the unit forming the superstructure is provided or covered with material forming the tooth prosthesis, for

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example acrylate or another synthetic material used in tooth prostheses.

10. The method as claimed in any of the preceding patent claims, characterized in that the recesses for
5 the securing members have diameters which are only slightly less than the width (A) of the prosthesis-supporting part (1a).

11. The method as claimed in any of the preceding patent claims, characterized in that, at the time of
10 its production, the superstructure is given an arc shape and in that, at the ends of the arc shape, there are parts (1a, 1b) with a first bevel (11, 11b) which is arranged on the bearing part and which via a curved part (12, 12') merges with the lower surface of the
15 tooth-prosthesis-supporting part, which in turn is curved up toward the outer edge of the tooth-prosthesis-supporting part via a second bevel (13, 13').

12. A superstructure arrangement which is intended
20 to be included in a tooth prosthesis system together with, inter alia, positioning members (14), drill guide sets (15), fixture guide sets (16) and fixtures (2, 3, 4) or fixture members, for example consisting of fixtures and spacer members, and securing members for
25 anchoring the superstructure in the fixtures or fixture members, which tooth prosthesis system makes it possible in a short application time, for example in one or only a few days, to apply a complete tooth prosthesis to dentine, primarily of the lower jaw, said
30 superstructure comprising a bearing part (1b) which can cooperate with the fixtures or fixture members, and a tooth-prosthesis-supporting part (1a), and the parts being designed with continuous recesses (1d) for said securing members (7, 8, 9), characterized in that the
35 bearing part and the tooth-prosthesis-supporting part form a common unit, and in that the superstructure works without being included in the covering function for the exposed end surfaces of implanted fixtures or fixture members and can be removed from the fixtures or

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fixture members during application of said tooth prosthesis to the unit.

13. The arrangement as claimed in patent claim 12, characterized in that the bearing part (1b) of the common unit cooperates with fixtures or fixture parts with cutting edges at their front parts which provide a direction-ensuring function during screwing into the dentine (5), irrespective of the homogeneity of the latter.

14. The arrangement as claimed in patent claim 12 or 13, characterized in that the bearing part (1b) of the unit is provided with depressions (1c) with plane bottom surfaces via which the bearing part lies against the top surfaces of the fixtures, the fixture members or their spacers.

15. The arrangement as claimed in patent claim 12, 13 or 14, characterized in that the tooth-prosthesis-supporting part is provided with a shape which in the horizontal cross section of the superstructure is narrower than the configuration of the bearing part, and in that the parts are formed with one or more outside transitions (11, 11') which form a curved or arc-shaped transition between the parts (1a, 1b).

16. The arrangement as claimed in any of patent claims 12-15, characterized in that, at its surface cooperating with the fixtures or fixture members, the bearing part is given depressions (1c) with plane bottom surfaces which are opposite the free end surfaces (2c) of the fixtures or fixture members, and in that the plane bottom surfaces of the depressions have surface areas which exceed the surface areas of the fixtures or fixture members at the parts of the fixtures or fixture members cooperating with the bearing part.

17. The arrangement as claimed in any of patent claims 12-16, characterized in that the tooth-prosthesis-supporting part (1a) is provided with a number of holes (1f) extending in the transverse direction.

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18. The arrangement as claimed in any of patent claims 12-17, characterized in that the parts are made of titanium or another tissue-compatible material or tissue-compatible alloy.

5 19. The arrangement as claimed in any of patent claims 12-18, characterized in that the superstructure is designed with a common low height (H) of between 0.5 and 1.0 mm, preferably between 0.7 and 0.8 mm.

10 20. The arrangement as claimed in any of patent claims 12-19, characterized in that, at its front parts, the unit forming the superstructure is arranged such that it can be covered by material forming the tooth prosthesis, in the form of acrylic or another synthetic material used in tooth prostheses.

15 21. The arrangement as claimed in any of patent claims 12-20, characterized in that the recesses (1d) for the securing members (7, 8, 9) have diameters which are only slightly less than the width (A) of the tooth-prosthesis-supporting part (1a).

20 22. The arrangement as claimed in any of patent claims 12-21, characterized in that the superstructure (1) has an arc shape and in that, at the ends (1a', 1a'') of the arc shape, the bearing part (1b) is designed with a first bevel (11, 11') which merges via
25 a curved part (12, 12') into the lower surface of the tooth-prosthesis-supporting part, which lower surface in turn is curved up toward the outer edge of the tooth-prosthesis-supporting part via a second bevel (13, 13').

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Fig. 1

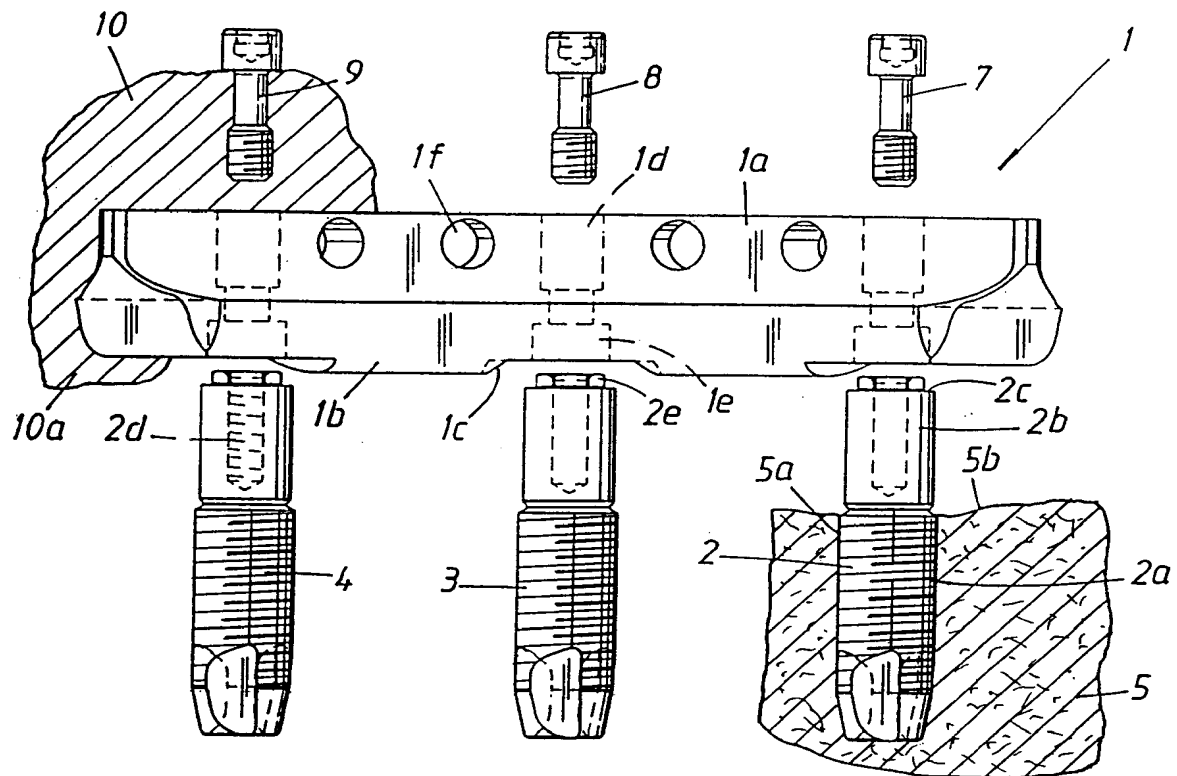


Fig. 2

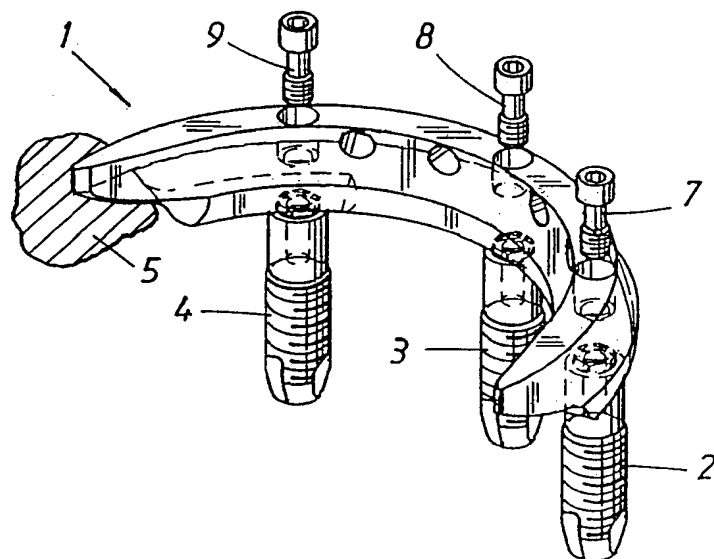


Fig. 3

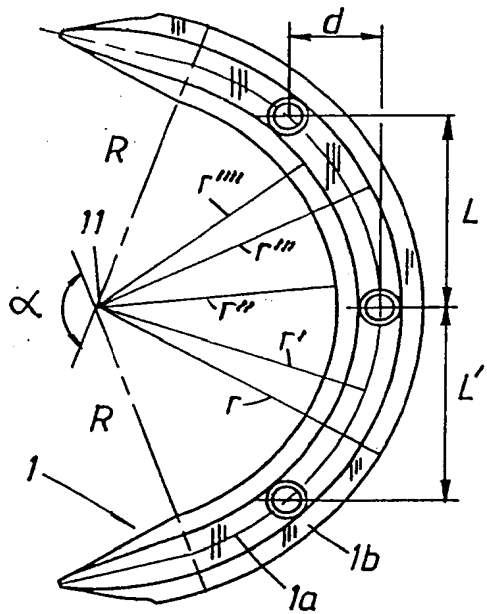


Fig. 4

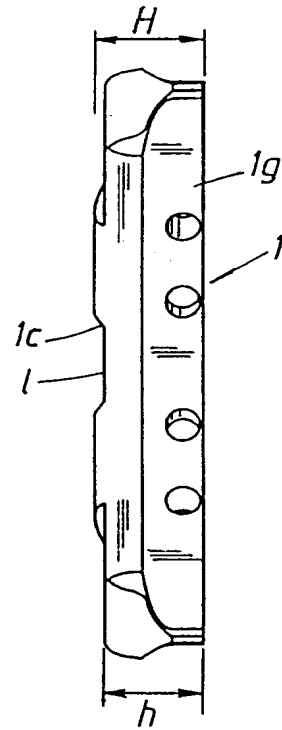


Fig. 6

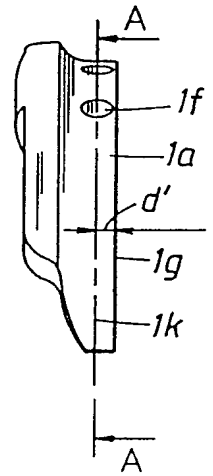
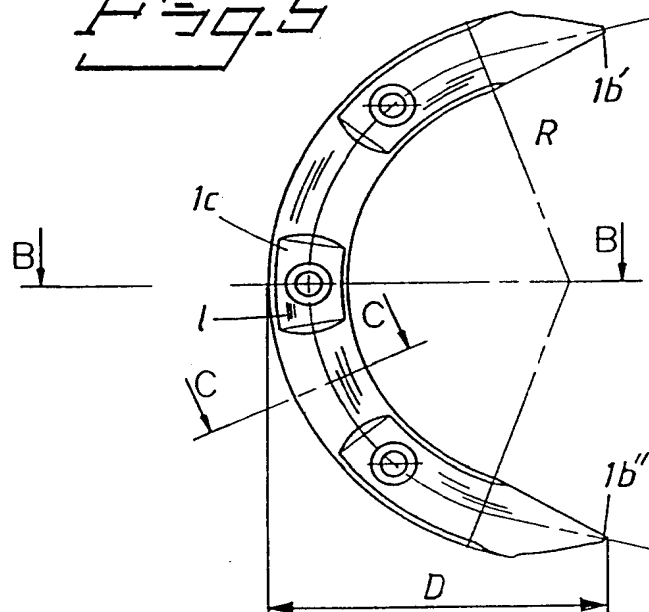
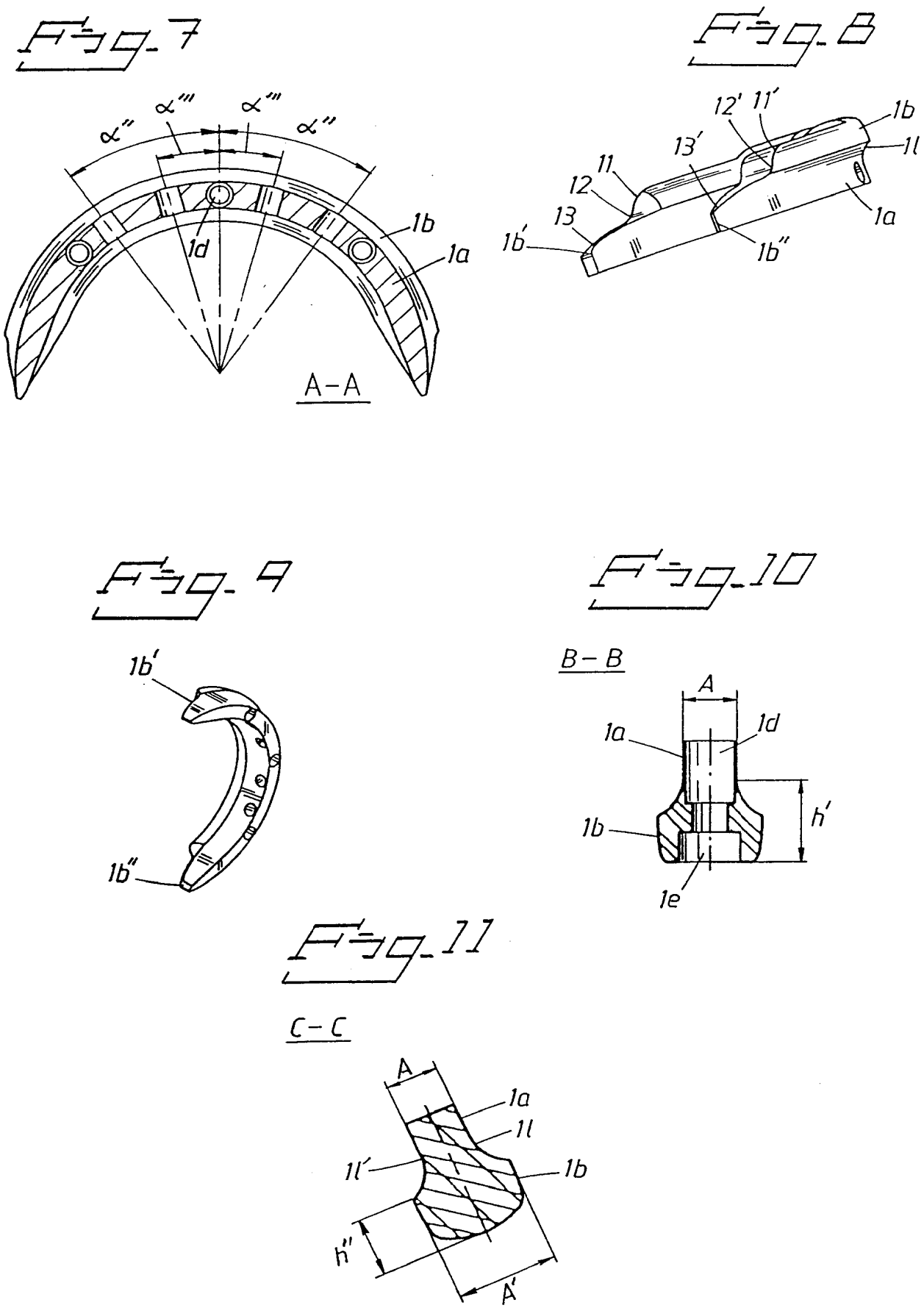


Fig. 5





INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 01/00166

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A61C 8/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A61C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9749351 A1 (MEDEVELOP AB), 31 December 1997 (31.12.97) ----- -----	1-22

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search

3 May 2001

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

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